>cmfocus

TIMESTRETCHING

Bend time to fit your track, whether you want to correct an out-of-time recording or go wild with sound design

cm DVD
ON THE DVD

Audio files to accompany the walkthroughs are in the **Tutorial Files** folder

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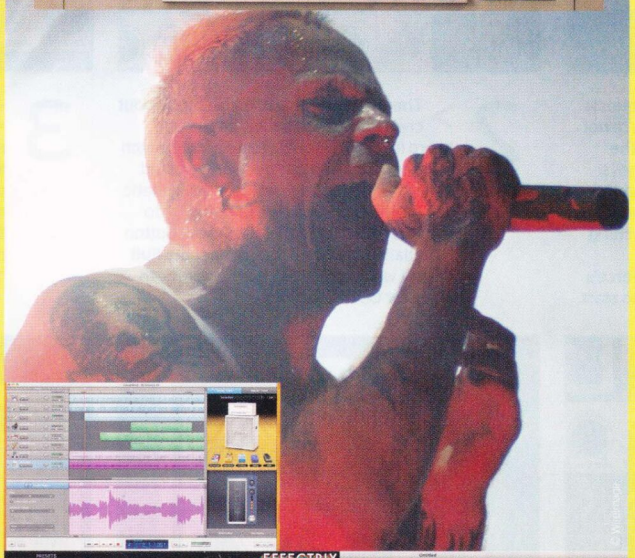

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> In the realm of recorded sound, time is endlessly flexible – in an illusory sense, at least – thanks to timestretching technology. The applications of it are many and varied. You might want to tighten up the recorded performance of a tempo-wandering musician, or sustain an important note for a touch longer; you might be looking to merge two recordings of totally different tempos; or you might be indulging in a spot of creative sound design.

Yet no matter how far technology advances, the laws of physics impose challenges on our time-bending adventures. Tonal sound is the result of vibrating air molecules. All sounds owe their pitch to the frequencies of those vibrations. Therefore, pitch and speed are intrinsically linked, and on the surface it would seem that you can't modify one without affecting the other. Imagine the sound of a tape player running low on batteries, or a record playing at the wrong speed. No doubt you naturally imagine slowed-down sound as having a lower pitch, and sped-up sound as being squeakier.

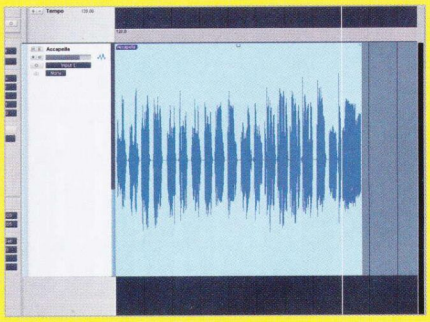
In recent years, software developers have made it possible to pitchshift digital audio without affecting its length, as well as timestretching/compress it without altering its pitch. Clever stuff!

Invented in the 'sampling golden age' of the 80s, early timestretching technology sounded unusual, to say the least, and wasn't really up to the job of transparent timing correction. However, this only served to make the effect more unique and probably more popular.

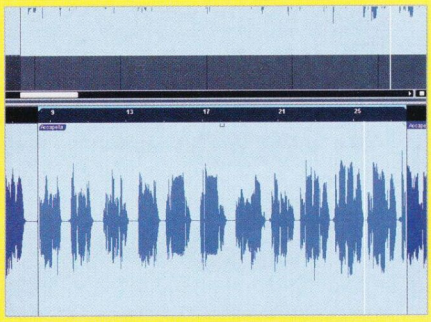
"Early timestretching technology sounded unusual, but this made the effect more unique"

As new and ever-more convincing timestretching algorithms have come onto the market, we now have the ability to make time domain edits for purely practical purposes, convincingly maintaining the character and integrity of the sound being compressed or stretched. Still, we should never overlook the array of interesting timestretch effects made possible by older pieces of software and retro processing techniques, from which we can still extract plenty of exciting creative use.

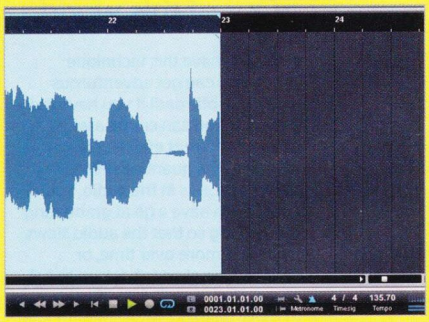
> Step by step Tighten the timing of a vocal



1 > Whether you've recorded a live vocal part or are simply importing a sample, chances are there'll be some room for improvement and a little creative licence as far as the timing goes. We've included a mini acapella on the **cm** DVD so that you can follow along with exactly what we're doing. The file is **Acapella.wav**.



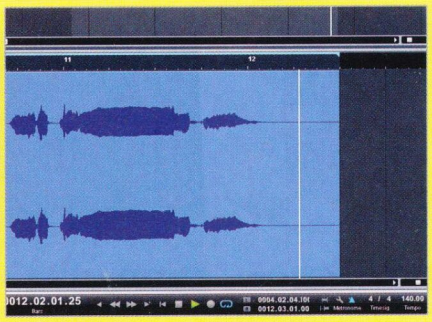
2 > You'll want to cut the performance into a musically meaningful number of beats to make the job easy. The part needs to loop nicely, and ideally you'll be able to cut a loop that's longer than the section you intend to use. Our chosen loop is 88 beats – or 22 bars (four beats per bar) – long.



3 > Adjust your DAW's project tempo until the cut loop adheres as tightly as possible to the desired number of bars/beats. In our case, our 22-bar loop just about touches the edge of bar 23 our tempo is set to **135.70bpm**. It helps to use the metronome and listen while you fine-tune the timing.

4 > Make cuts in the audio at sensible points – preferably where there are silences between phrases, although 'S' and other consonant sounds often make great spots if you want to slice and dice discretely. Essentially, we're chunking up to make the next step more manageable.

5 > Isolate the slices you want, then listen carefully to them as they play in a loop. Adjust the start point of each slice and use stretching to perfect the timing. You might find you need to slice these parts further to get into detail with the timing.



6 > Bounce/export the results of your tightening. It's a good idea to name the file with the current tempo and number of bars (or beats if that's easier). Now you can set your host tempo to whatever you want it to be and simply stretch the whole tightened vocal until it reaches the number of bars required.

Timestretching classics from the 90s

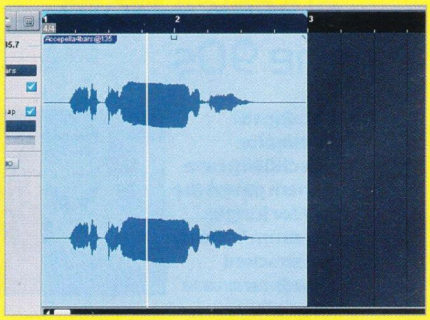
Metalheadz
Terminator
This chilling rave anthem paved the way for jungle and drum 'n' bass, and shocked crowds en masse when about halfway through the record, the beats started to shift in pitch. Although technically pitchshifting was used, it inspired a generation of producers to experiment with timestretching on their Akai samplers for the first time.

The Prodigy
Smack My Bitch Up
So much of this record was made by timestretching samples from other people's music that it would be impossible to list them all here. At the very least you should be able to spot the intentional echoing timestretch artefacts on the main vocal hook, which is sampled from Ultramagnetic MCs' *Give The Drummer Some*.

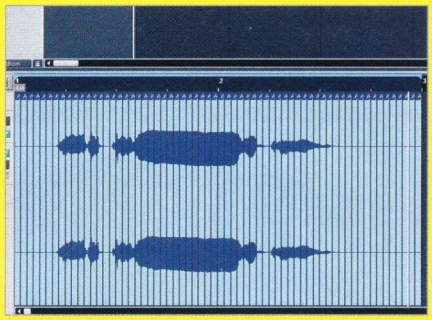
Dead Dred
Dred Bass
This strange record reinvented the jungle formula by using a bass sound that was neither punchy nor growling. It also tied sections together with a seemingly random sample of a Caribbean chap asking for the time. Oh yes, and said sample was timestretched for no apparent reason other than to add flavour.

Slipmatt
Hear Me
A time-compressed piano and vocal sample lead the way at nearly 160bpm on this jungle-influenced hardcore classic. Then, in a fashion quite different to Metalheadz' *Terminator*, the middle of the record explodes into a breakbeat that's both timestretched and pitchshifted simultaneously. The results are almost melodic.

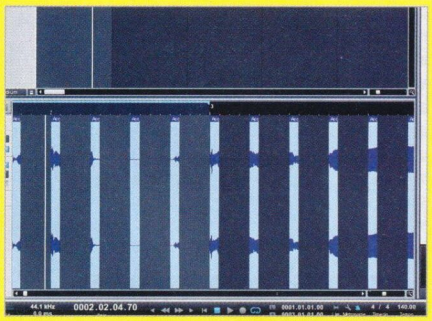
> Step by step Old-skool manual timestretching



1 > This particular vocal timestretching trick probably won't suit a whole verse or chorus, since we're going to draw out the vocal part, but it's a neat little effect to try on a succinct phrase. If your vocal part is a long one, you'll need to start by trimming it down to a single phrase.

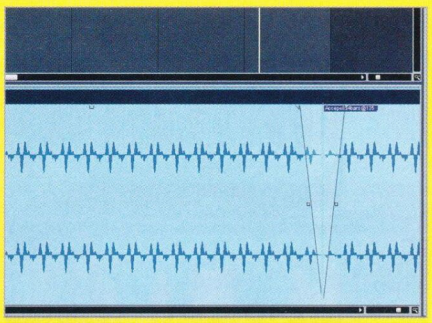


2 > Zoom in and set your DAW's quantise to **1/32**. The effect works with other quantise values and will produce a more extreme sound at 1/64 or 1/28. Here we've used the cutting tool to splice the audio part into 32nd-notes.



3 > Next we space the audio fragments out by the factor by which we want to timestretch. So, for example, if you want to double the length you'll have to make double the space. In this example we're quadrupling, leaving a triple-sized space after every block of audio.

4 > Now we need to fill in those gaps. We do this using copies of the audio slice preceding each gap. This can be a tedious job if you have to manually copy and move each one, so hopefully your sequencer enables you to select and copy several at once.



5 > Play back what you now have. You'll notice that the audio slices click rather unpleasantly. To fix this, select all the slices again and fade them in and out at either end. Keep the fades very short or you'll inadvertently produce an effect worse than the clicking we set out to remove.

POWER TIP

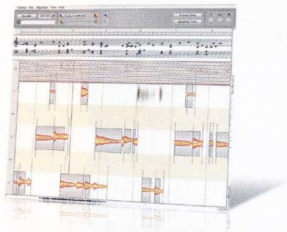
>Out of this world

Once you have this technique down, you can get adventurous with it. Go off-road! If you have the patience, you can create a wide array of different effects. Try changing the quantise setting at different points in the audio. You could even have a go at graduating the spacing so that the audio slows more and more over time, or maybe even speeds back up to full speed. One very simple effect is to make an extra large space in, say, a distinct vowel sound and then stretch that one syllable to be much longer than the rest.

Four great timestretching applications

Cockos Reaper $40/150

Behind the shy price tag, Reaper packs just as much punch as any other professional DAW on the market, and that includes its timestretching and pitchshifting capabilities. You can select from a number of intelligent algorithms, including the world-class Elastique 2 Pro, when bending time to suit your requirements.

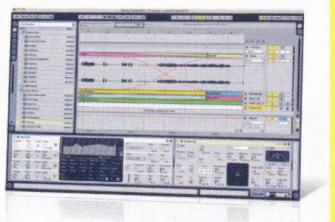


Celemony Melodyne Editor £299

Arguably the most powerful timestretching system around, the latest version of Melodyne features Celemony's famous Direct Note Access technology (DNA for short), enabling you to timestretch individual notes within a polyphonic recording. If you can afford it, this is where your timestretching lust should ultimately lead you.

Sugar Bytes Effectrix €99

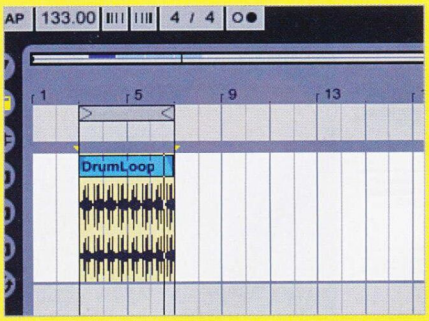
This is a multieffects sequencer rather than a dedicated timestretching plug-in, but it does enable you to create sequences that timestretch the incoming audio in real-time. It boasts built-in automation and fine control over the stretch algorithm's parameters, including time, grain size and fade percentage, for a broad palette of effects.



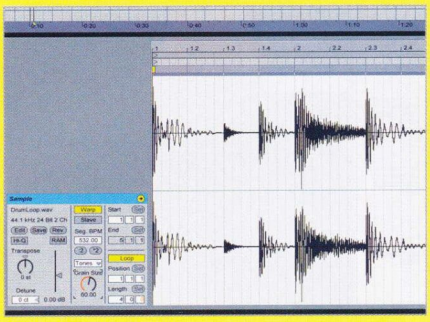
Ableton Live 8 £400

Ableton's famous DAW treats timestretching as an intrinsic part of its audio engine, rather than a separate element of it. Throw in a bunch of loops and they'll be automatically stretched/compressed to fit the project tempo. This still seems like a music technology miracle even a decade after it was first released.

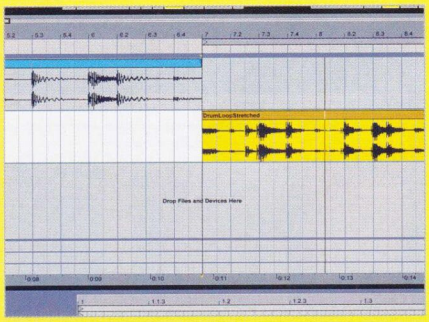
> Step by step Old-skool beat timestretching



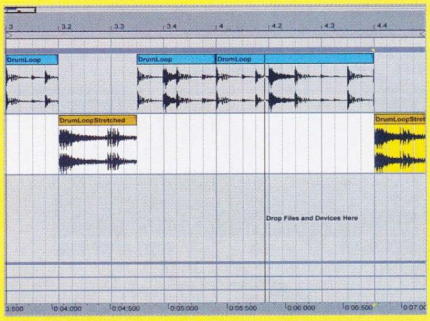
1 > You'll need a sampled drum loop for this effect, so either produce your own loop, bounce it down and reimport it, or load up the file we've supplied on the **cm** DVD: **DrumLoop.wav**. The length is one bar and the tempo is 133bpm.



2 > Next we want to stretch the loop out – or, rather, take its speed down to a quarter of the original tempo. We want to create a sort of echoing effect as we do this (much like the results of the previous walkthrough), so a medium to high **Grain size** is essential if you're using Ableton Live, as we are.

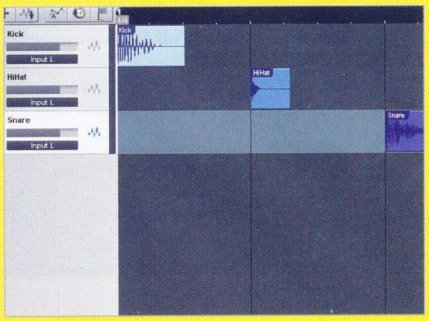


3 > Bounce the stretched copy, then double its speed and pitch using tape- or vinyl-style timestretching – ie, an algorithm in which pitch and speed are directly linked. This produces a loop that's half the speed and double the pitch, with a distinctive old-skool ringing effect.

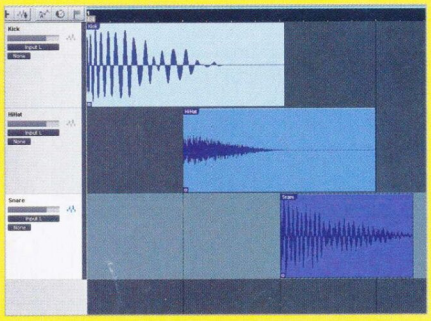


4 > Now it's just a case of arranging the parts. You might find it fun to chop out bits of the original drum loop and fill the gaps with chops from the timestretched version. That should give the impression of a single beat being twisted.

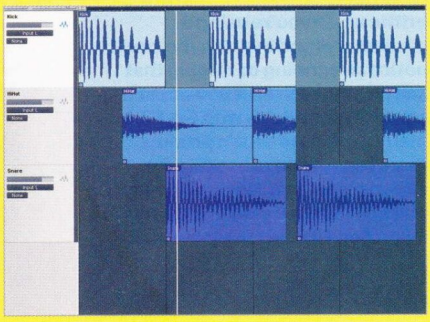
> Step by step Modern beat timestretching



1 > For this method you'll need a beat comprising single-hit samples placed on audio tracks. Make lots of space for stretching them. We're simply using a kick, closed hi-hat and snare, all of which you'll find on the **cm** DVD.



2 > You'll need to listen very critically here and judge the results for yourself, but the general idea is to stretch the sounds as far as they'll go without losing all semblance of percussiveness. You might have to bounce the audio and repeat the process if you reach your software's limits.



3 > Now create a rhythm with the stretched hits. Play with the lengths of each hit and work out what sounds good overlapping and what doesn't. You should expect to be able to produce some truly wild and crazy rhythmic effects with your new droning sound-set.

You do the maths

It's one thing to work with well-cut loops that fit your sequencer's bar grid out of the box, but occasionally when timestretching you might first need to figure out the tempo of a given piece of audio.

The first thing you should do is to cut the audio so that it lasts for a sensible number of beats. That's fairly easy if you're working with a one-bar drum loop, but not so straightforward when you're dealing with a vocal that doesn't start or end clearly on a beat. In that case, select a region over which you think you have a whole number of beats and play it back in a loop. Nod your head or tap your knee where you would expect the beats to land and if the loop seems to come back around too fast or slow, adjust the selection until it loops perfectly. Make sure the beats can be evenly counted all the way through to the end and round to the start again.

Now, let's say that your vocal is 36 beats long. Note how long that 36-beat loop lasts in seconds, then divide that number by the number of beats and note the result. Finally, divide 60 by that final figure, and the result is the tempo of your loop in beats per minute.

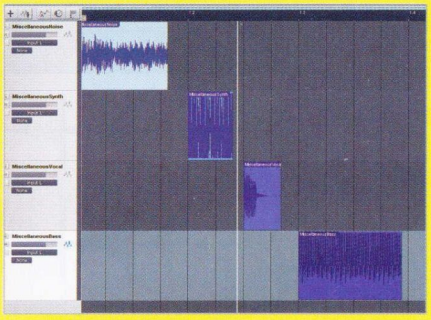
Beyond practicality

Many producers consider timestretching a function to be used for practical and corrective uses, but as we've shown, there's so much more you can do with it than just make a vocal fit your project tempo. As well as the trippy effect it can produce, timestretching's potential applications as a resynthesis tool range from the subtlest of tweaks to the point at which one sound becomes a totally unrecognisable new texture.

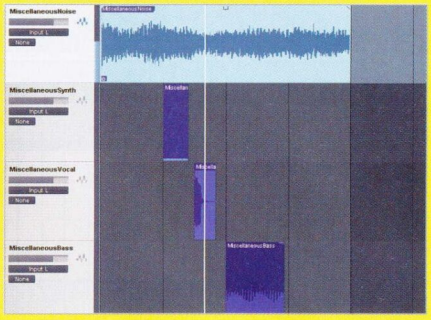
You'll find that the timestretching algorithms in different software packages sound different to each other: some have parameters that can be adjusted, or feature multiple algorithms tailored to suit specific instrument/sound types. Of course, the differences between one algorithm and the next might not be immediately obvious, and it's probably not practical to expect to be able to predict how, say, ten different algorithms might sound in any given circumstances. Rather, you'll probably develop a few favourites that you'll begin to be able to predict approximately, over time. This is an important stage in being able to get the most out of timestretching: knowing which stretch to use for which job.

Fear not, though, for some of the best effects you'll discover will come through good old trial and error. Make a point of mentally noting any inadvertent side-effects that occur whenever you apply timestretching (even when you're doing it for corrective reasons), no matter how subtle they might be. Remember that different types of material are prone to different types of artifacts - perhaps drum transients get smeared, or reverberation becomes hard and brittle when you're using a particular algorithm. Maybe you'll notice an echoing or ringing that can be emphasised if you boost certain frequencies with EQ. Like many aspects of music production, there really is no substitute for experimentation. Have patience and be open to trying things even if you don't expect them to work.

> Step by step Build a timestretch soundscape



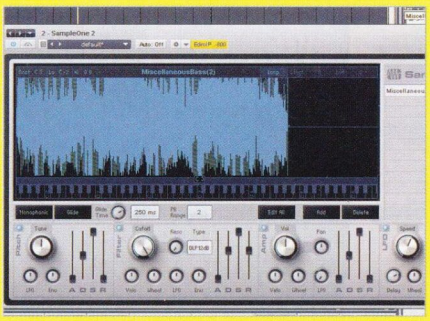
1 > Now let's take timestretching to the extreme. We're going to build an entire soundscape from timestretched noises. The idea here is to exploit the audible effects of timestretch algorithms as well as turning otherwise too-short sound clips into more versatile sonic tools.



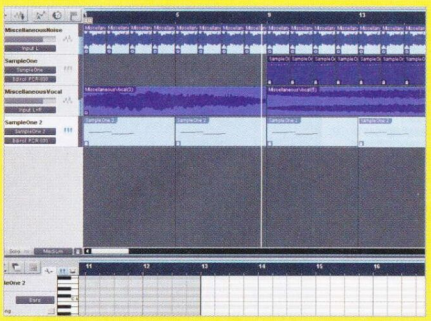
2 > On the **cm** DVD you'll find a file called **MiscellaneousNoise.wav**. It's a tight, photocopier-style sound with a knocking transient. It screeches and whirls, but it's going to sound quite different once we've stretched it to make it a bar long. Check out that natural rhythm.

3 > Next, **MiscellaneousStab.wav**. Again, using your ears to guide you, stretch the stab and keep stretching until you're satisfied. If you don't stretch it enough, it'll remain short and won't accrue much texture; but if you stretch it too far, it'll whine. Find a happy medium and load it into a sampler.

4 > You'll also find **MiscellaneousVocal.wav** on the DVD: this is a one-syllable stab with not much distinct character, taken from a longer acapella. Again, stretch it as far as you think you can get away with, then drown it in long reverb.



5 > The process for **MiscellaneousBass.wav** will be very similar to that of the stab, except that this time we can afford to stretch further. This is because it'll be safe to filter out any top-end artefacts on the bass after we've loaded it into the sampler.



6 > With all that done, you're left with a unique palette of atmospheric sounds boasting plenty of personality. All that remains is to arrange them into something that makes musical sense. We loop up the noise, play the vocal forwards and in reverse, and add riffs for the stab and bass. Hear the results on the DVD. **cm**